

DERIVAT KITOSAN-TRIPOLIFOSFAT DAN APLIKASINYA SEBAGAI AGEN ANTIBAKTERI PADA KAIN KATUN

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INTISARI

Kitosan yang merupakan bentuk N-deasetilasi dari kitin telah banyak diketahui sebagai agen antibakteri. Kitosan dalam asam bersifat polikationik dan dapat bereaksi dengan muatan negatif seperti tripolifosfat (TPP) yang merupakan agen *crosslink* yang toksisitasnya rendah. Larutan kitosan dan ion-ion TPP dapat memberikan aktivitas antibakteri terhadap *Staphylococcus aureus*. Aktivitas antibakteri dari hasil *crosslink* kitosan dengan TPP belum pernah dikaji. Tujuan dari penelitian ini adalah mengkaji mengenai aktivitas antibakteri kain katun terlapisi kitosan-TPP.

Telah dilakukan isolasi kitin dan kitosan dari kulit udang putih (*Litopenaeus vannamei*). Sintesis derivat kitosan-TPP dilakukan dengan mereaksikan larutan TPP dengan larutan kitosan, menggunakan larutan TPP yaitu pH 2; 3; 4; 7,7 dan 8,7. Kitosan dan kitosan-TPP dilapiskan pada kain katun dengan metode *pad-dry-cure*. Uji aktivitas antibakteri *S. aureus* dilakukan pada larutan kitosan dan kitosan-TPP serta pada kain yang dilapisi kitosan dan kitosan-TPP.

Berdasarkan hasil isolasi diperoleh kitin dan kitosan secara berurutan 20,95% dan 15,68%. Derajat deasetilasi dan berat molekul dari kitosan yang dihasilkan adalah 87,50% dan 176634,4 Da untuk perhitungan dengan baseline *a* sedangkan untuk baseline *b* diperoleh 96,50% dan 129177,0 Da. Kadar fosfat maksimum diperoleh pada kitosan-TPP yang disintesis dari larutan TPP pH 4 yaitu sebesar 14,09%. Berdasarkan uji bakteri, larutan kitosan-TPP memberikan aktivitas antibakteri. Kain yang terlapisi kitosan-TPP memberikan aktivitas antibakteri yang lebih besar daripada kain yang terlapisi kitosan. Kain yang dilapisi kitosan dan kitosan-TPP pada jam ke-48 mampu menghambat pertumbuhan bakteri secara berurutan sebesar 78,40 dan 90,31%. Proses pencucian dengan Tween-20 akan meningkatkan aktivitas antibakteri kain katun tanpa perlakuan, kain terlapisi kitosan dan kain terlapisi kitosan-TPP secara berurutan sebesar 21,99; 13,48 dan 6,07%.

Kata kunci : kitosan, kitosan-TPP, uji antibakteri

CHITOSAN-TRIPOLYPHOSPHATE DERIVATIVE AND ITS APPLICATION AS ANTIBACTERIAL AGENTS TO COTTON FABRICS

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ABSTRACT

Chitosan which is N-deacetylated form of chitin has been widely known as antibacterial agent. Chitosan is polycationic in acidic media and can interact with negatively charged species such as tripolyphosphate (TPP), which is a nontoxic crosslinking agent. Chitosan solution and TPP ions have shown antibacterial activity against *Staphylococcus aureus* but the antibacterial activity of crosslinked chitosan-TPP have not yet explored. Thus, the aim of the present work was to study about antibacterial activity of cotton coated chitosan-TPP.

Chitin and chitosan have been isolated from white shrimp (*Litopenaeus vannamei*). The synthesis of TPP crosslinked chitosan was performed by reacting TPP solution with chitosan solution at 5 different pH conditions namely pH 2, 3, 4, 7.7 and 8.7. Chitosan and chitosan-TPP were coated on cotton fabrics by pad-dry-cure method. Antibacterial activity of chitosan and chitosan-TPP solutions, as well as cotton coated chitosan and chitosan-TPP were examined against *S.aureus*.

The result showed that process efficiency of chitin and chitosan were 20.95% and 15.68%, respectively. The degree of deacetylation (DD) and molecular weight of chitosan were 87.50% and 176634.4 Da (calculated by using baseline *a*) and 96.50% and 129177.0 Da (using baseline *b*). Chitosan-TPP synthesized from TPP at pH 4 has shown optimum phosphorous content of 14.09%. The antibacterial activity test showed that chitosan-TPP solution and cotton coated chitosan-TPP have shown antibacterial activity. Chitosan-TPP coated cottons exhibited higher antibacterial activity than that of chitosan coated cottons. Chitosan coated and chitosan-TPP coated cottons at 48 hour could inhibit bacterial growth until 78.90 and 90.31%, respectively. Laundering test using Tween-20 increased antibacterial activity of the untreated cotton fabrics, chitosan coated and chitosan-TPP coated cottons were 21.99, 13.48 and 6.07%, respectively.

Keywords: chitosan, chitosan-TPP, antibacterial tested.